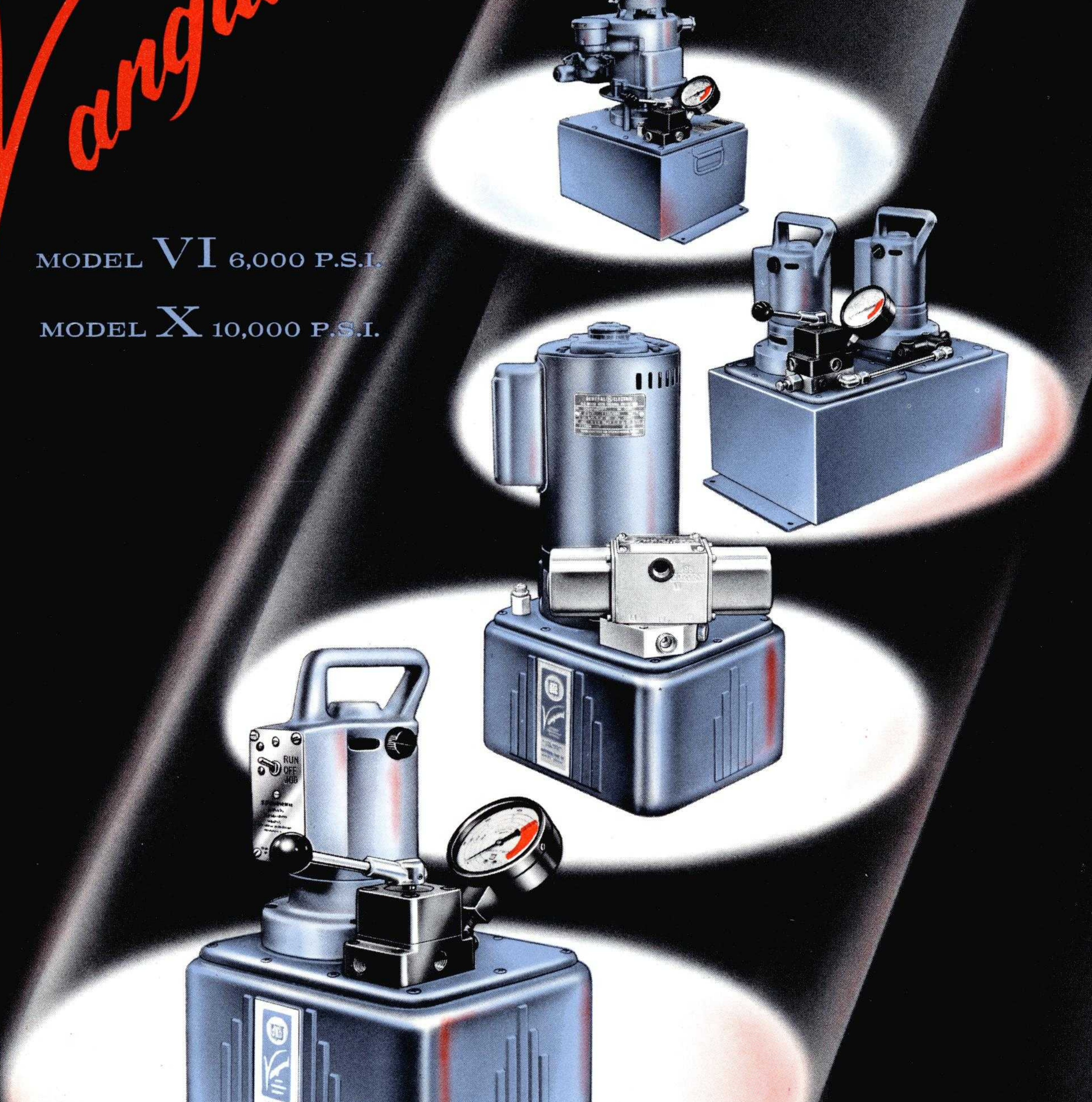
BROCHURE NO. V-2

Vanguard

TWO-STAGE · HIGH PRESSURE
HYDRAULIC POWER PACKAGES

MODEL VI 6,000 P.S.I.

MODEL X 10,000 P.S.I.



RESEARCH · ENGINEERING · DEVELOPMENT

OTC

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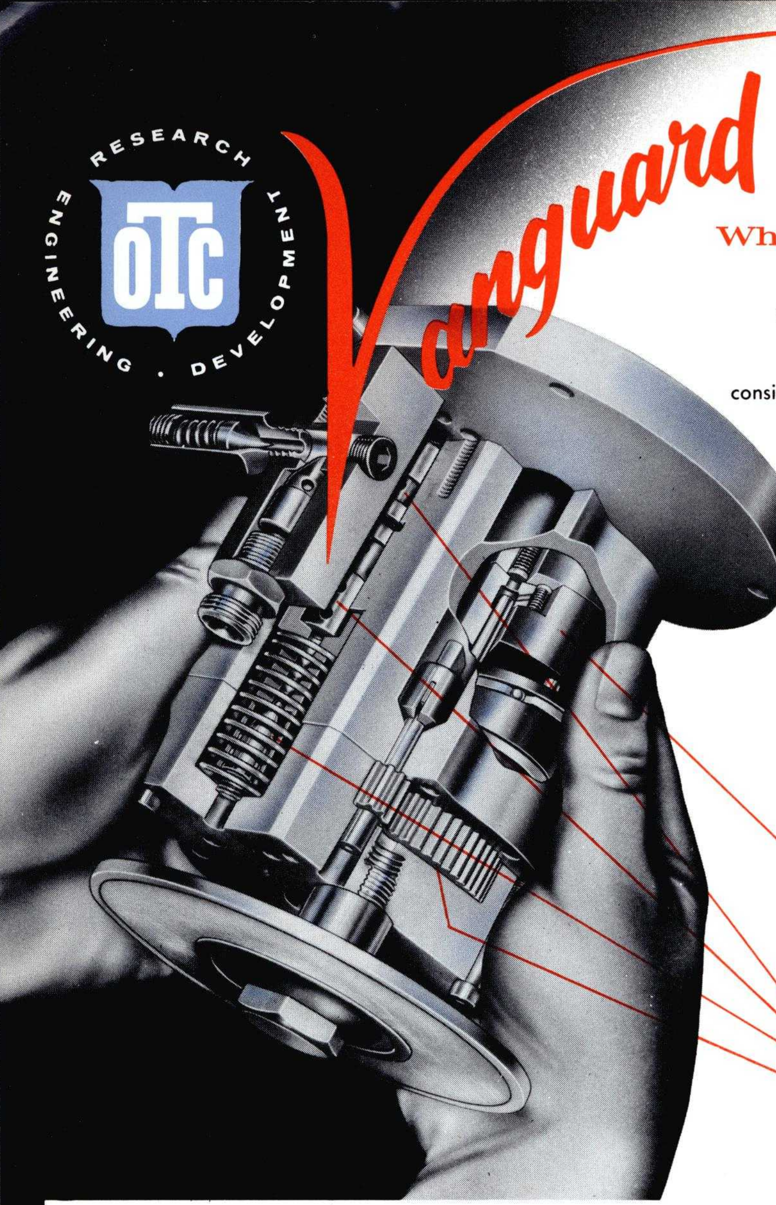
PRECISION HYDRAULICS
DIVISION
**OWATONNA TOOL
COMPANY**
OWATONNA, MINNESOTA

DISTRIBUTED BY

Vanguard

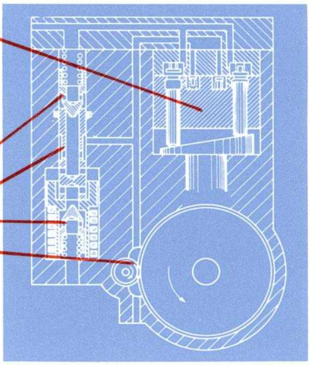
TWO-STAGE, HIGH-PRESSURE,
HYDRAULIC POWER UNITS



What Is Vanguard? How Does It Work?

The OTC "Vanguard" is a quiet-operating, precision-built, two-stage hydraulic (oil) pumping unit—compact, lightweight, versatile, dependable. A pre-engineered, off-the-shelf package!—with building-block flexibility. It is a dual-volume, dual-pressure unit consisting of a unique combination of a gear pump for the low-pressure stage and a five-cylinder axial piston pump for the high-pressure stage. In addition to handling high-pressure high-force requirements, its high volume at low pressure (i.e. 2.6 g.p.m. at 100 p.s.i.) give fast ram approach and return!—no wasted time getting the cylinder piston to and from the work! A motor or engine drives the gear pump; the shaft of the large gear is connected to and drives the wabble plate of the piston pump. Oil from the gear pump supercharges the piston pump, thereby eliminating possible cavitation, insuring contact of the pistons with the wabble plate without the use of springs and permitting the use of smaller spring-loaded intake valves and smaller oil passages. A smooth-operating, compact design! Vanguard versatility includes your choice of motors, control valves, pressure switch, remote motor controls, etc. See pages 4-7.

- **Five-cylinder axial piston pump** (high pressure stage); precision-fitted pistons and cylinders, heat-treated, Nitride-hardened and honed to a super finish.
- **High pressure check valve.**
- **Unloading valve.**
- **Supercharge relief valve.**
- **Gear pump** (low pressure stage); high quality precision-fitted gears, hardened, ground and lapped.

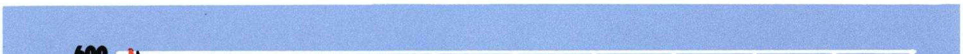


What Does Vanguard Do? What Is Its Performance?

The Vanguard is like 2 pumps in 1! Its gear pump delivers high volume at low pressure for fast ram approach and return, and its piston pump delivers low volume at high pressure to handle high force requirements. Vanguard is available in two pressure ranges:

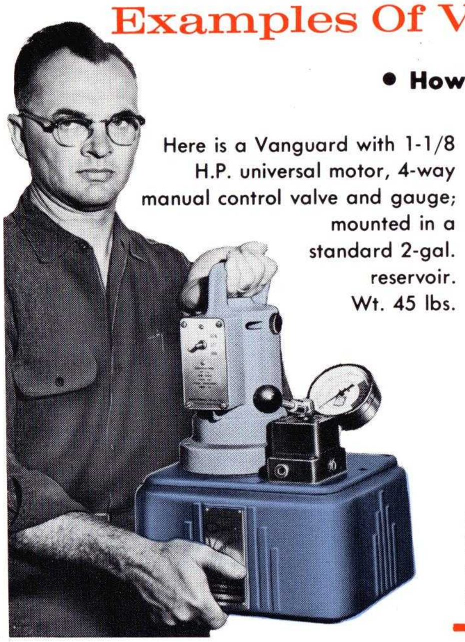
VANGUARD VI—Y-60 Series—For operating pressures up to 6,000 p.s.i.
VANGUARD X—Y-26 Series—For operating pressures up to 10,000 p.s.i.

Vanguard VI and X have identical low pressure delivery characteristics; Chart shows difference in high pressure stages. Each Vanguard is equipped with a factory-set safety relief valve set at maximum pressure; a setting other than maximum can be specified for initial setting at the factory. Motors and accessories on pp. 4-7 can be used with either model.



Examples Of Versatile Vanguard Power Packages

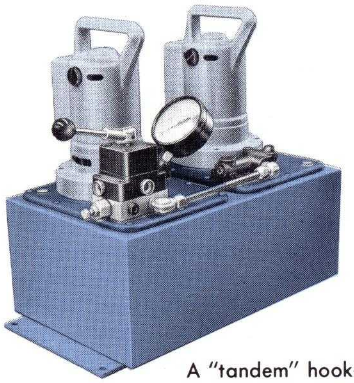
- **How six Vanguards might look**
- **Details of components on pages 4-7**



Here is a Vanguard with 1-1/8 H.P. universal motor, 4-way manual control valve and gauge; mounted in a standard 2-gal. reservoir. Wt. 45 lbs.

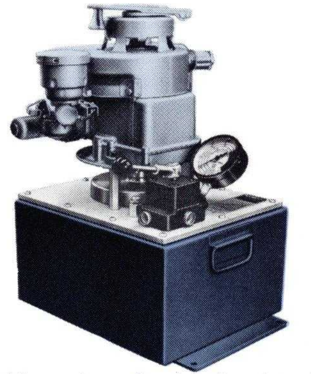
Here is a Vanguard with universal motor, 2-gal. reservoir, 2-way manual control valve, pressure switch, pressure regulating valve, gauge and casters.

This Vanguard, with universal motor and 2-gal reservoir, is equipped with a 2-way solenoid-controlled valve, pressure switch (behind valve) and gauge.



A "tandem" hookup: two Vanguards in a single 7-gal. reservoir. Produces twice the volume! With single 4-way valve and gauge.

This Vanguard is equipped with a 3450 r.p.m. 1-1/2 H.P. jet pump motor, plus a 4-way solenoid-controlled valve, mounted on a standard 2-gal. reservoir.



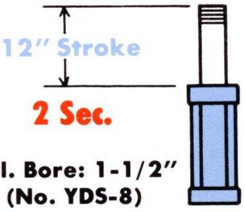
For field use where electricity is not available is a Vanguard such as this: with 3 H.P. gasoline engine mounted on a standard OTC 5-gal. reservoir.

Examples Of Vanguard Pumping Speed In Both Stages

ENTIRE STROKE AT LOW PRESSURE

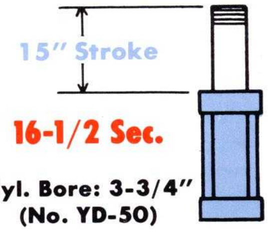
Based on a Vanguard equipped with a 1-1/8 H.P. universal motor, examples to the right show the pumping speed in terms of ram travel with specific OTC cylinders. The examples are for "approach" only.

Below, the examples are for two typical 3-part cycles: approach at low pressure, a pressure stroke and return at low pressure.



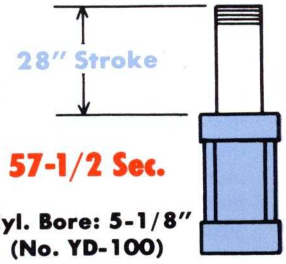
2 Sec.

Cyl. Bore: 1-1/2"
(No. YDS-8)



16-1/2 Sec.

Cyl. Bore: 3-3/4"
(No. YD-50)



57-1/2 Sec.

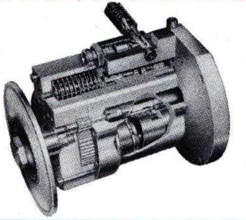
Cyl. Bore: 5-1/8"
(No. YD-100)

EXAMPLES OF 3-PART CYCLES (TIMES IN SECONDS)

	VANGUARD X (Y-26A)				VANGUARD VI (Y-60A)			
[TRAVEL IN INCHES]	YDS-8 1½" Bore	YDT-30 Two 2"	YD-50 3¾" Bore	YD-100 5⅛" Bore	YDS-8 1½" Bore	YDT-30 Two 2"	YD-50 3¾" Bore	YD-100 5⅛" Bore
1. Approach at low pressure:	(10") 1.76	(13") 8.2	(13") 14.3	(26") 53.5	(10") 1.76	(13") 8.2	(13") 14.3	(26") 53.5
last 2" at 5,000 p.s.i.:	(2") 3.23	(2") 11.7	(2") 20.3	(2") 38.0	(2") 2.00	(2") 7.2	(2") 12.6	(2") 23.5
return at low pressure:	(12") 1.17	(15") 5.3	(15") 11.7	(28") 38.0	(12") 1.17	(15") 5.3	(15") 11.7	(28") 38.0
TOTALS	6 Sec.†	25 Sec.†	46 Sec.†	2'9"††	5 Sec.†	21 Sec.†	39 Sec.†	1'55"††
2. First half of stroke at low p.s.i.:	(6") 1.06	(7½") 4.7	(7½") 8.25	(14") 29.0	(6") 1.06	(7½") 4.7	(7½") 8.25	(14") 29.0
second half at 6,000 p.s.i.:	(6") 9.75	(7½") 43.5	(7½") 76.0	(14") 267.	(6") 6.00	(7½") 27.0	(7½") 47.0	(14") 165.
return at low pressure:	(12") 1.17	(15") 5.3	(15") 11.7	(28") 38.0	(12") 1.17	(15") 5.3	(15") 11.7	(28") 38.0
TOTALS	12 Sec.†	54 Sec.†	96 Sec.†	5'34"††	8 Sec.†	37 Sec.†	67 Sec.†	3'52"††

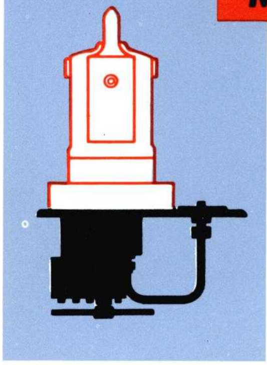
† (Totals rounded to the nearest full second) †† (In minutes and seconds)

How To Select Individual Vanguard Components



Second only to the time-saving, two-stage speed characteristics of the gear-piston pump itself is the wide-range versatility and flexibility in selecting and using an appropriate combination of individual components which make up a complete Vanguard power package. "Building-block" flexibility! After first determining which basic pump you need—the Y-26 10,000 p.s.i. model or the Y-60 6,000 p.s.i. model—then choose from the following listings the accessories to best fit your needs. Select a motor, a control valve, a reservoir, gauge, and (when appropriate) a pressure switch, pressure regulating valve, casters, remote controls, hose, etc.

MOTORS-ENGINES

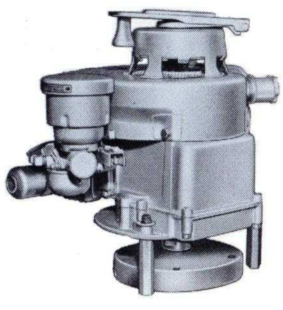


A, B

C, D

E, F

H, J



G

Motors mount (with four equally-spaced socket-head cap screws) on a common cover plate, on which pump and control accessories also mount. Nos. Y-26 and Y-60 refer to "pump" models; a suffix letter designates the desired motor or engine (see listings below).

NOTE: Specific characteristics of a particular application must determine which motor is chosen. In many instances, the "life" of the Vanguard package is based solely on the life of the motor, rather than on the pump itself or any other single component of the total package. In deciding between a universal motor and a jet pump motor, the advantages of the universal motor are easier portability and its general ability for continuous duty at full pressure—ideal for starting under load. The slower speed jet pump motors (3450 rpm, as opposed to the universal motor's 12,000 rpm) are generally preferred for fixed installations; being slower speed, the jet pump motors are quieter and will give longer life than the universal motors under the same load conditions.

In selecting among jet pump motors, 1½ H.P. models should be selected over the 1 H.P. models when motor will be required to start, operate and maintain the pumping at pressures beyond 60% of pump's maximum p.s.i.-rating. One H.P. motors will be enough, however, for occasional "peak" loads to high pressure. Three-phase models should be selected over single phase jet pump models when the motor will be required to make more than 20 starts per hour. Single phase jet pump motors, therefore, are not appropriate for high cycle applications. By selecting the proper motor for your Vanguard package, with considerations based on the above general thumbrules, you will alleviate the possibility of excessive overheating and gain longer motor life.

UNIVERSAL MOTORS

Universal Motor, 1⅛ H.P., 12,000 rpm, 115V, single phase, 60/50 cycle, AC. Not dual voltage. Lightweight, easy to carry; "handle-top" housing. For continuous duty at full pressure. Standard motor control—"on-off-jog" toggle switch, 35 amp motor control relay cavity-mounted in motor housing.......... ....**Nos. Y26-A & Y60-A**

Universal Motor, same as "A" above, except 230V instead of 115V...................................**Nos. Y26-B & Y60-B**

JET PUMP MOTORS

Jet Pump Motor, 1 H.P., 3450 rpm, 115V or 230V (please specify which voltage), single phase, 60/50 cycle, AC. Appropriate for low-cycle applications and working in pressures below 60% of pump's maximum p.s.i. rating, with occasional peaks to high pressure. Standard motor control—"on-off-jog" toggle switch, in switch box with motor control relay..**Nos. Y26-C & Y60-C**

JET PUMP MOTORS continued

Jet Pump Motor, same as "C" above, except with 1½ H.P. for working throughout the entire pressure range including the highest pressures.........................**Nos. Y26-D & Y60-D**

Jet Pump Motor, 1 H.P., 3450 rpm, 220V or 440V (please specify which voltage), three phase, 60/50 cycle, AC. Appropriate for high-cycle applications and working in pressures below 60% of pump's maximum p.s.i. rating, with occasional peaks to high pressure. Standard motor control—(optional)—"on-off-jog" toggle switch mounted on general-purpose enclosure; magnetic starter, size 0 (25 VA transformer) 220/440V primary, 110V secondary (transformer provides 110V for control circuit) ....**Nos. Y26-E & Y60-E**

Jet Pump Motor, same as "E" above, except for 1½ H.P. for high-cycle applications throughout the entire pressure range including the highest pressures...........**Nos. Y26-F & Y60-F**

Jet Pump Motor—Explosion/Dust/Ignition-Proof Motor: 1 H.P., 3450 rpm, fan-cooled, 115V or 230V (please specify which voltage), single phase, 60 cycle. Appropriate for low-cycle applications and working in pressures below 60% of pump's maximum p.s.i. rating, with occasional peaks to high pressure.... ....**Nos. Y26-H & Y60-H**

Jet Pump Motor, same as "H" above, except for 1½ H.P. for working throughout the entire pressure range including the highest pressures.....................**Nos. Y26-J & Y60-J**

GASOLINE ENGINE

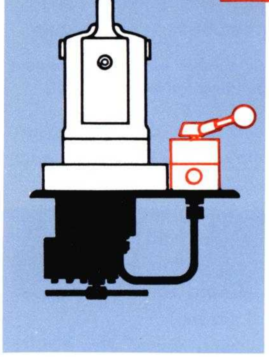
Gasoline Engine, four-cycle Briggs & Stratton model 80702, 3 H.P. at 3600 rpm. For field use. Provides continuous duty at full pressure...........................**Nos. Y26-G & Y60-G**

NOTE: For DC motor requirements, consult OTC factory.

"TANDEM" MODELS

Twice the volume can be obtained by interconnecting two Vanguards and mounting them in a single reservoir (7 gal., No. 50051). (Not possible with gasoline engine models.) To order two basic pumps in tandem, simply add a suffix letter "T" to the motor number (i.e. Y26-AT). Note: Specify verbally whether motors are to be controlled individually or together from a common switch.

CONTROL VALVES

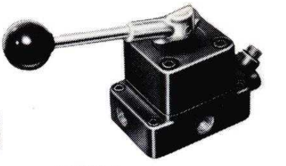


30383

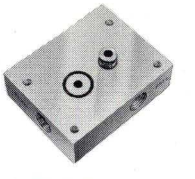
30601

30384

30598

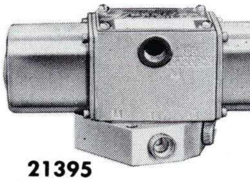


30394

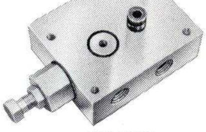


30547

21712



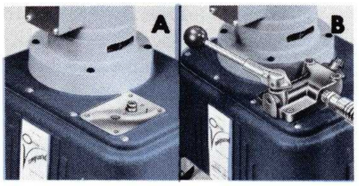
21395



30588

In addition to whether Vanguard will power single or double-acting cylinders, select a valve with considerations as to how close the pump will be to the cylinder(s), ease of operator control, his position by the work, frequency of the operation or cycle, degree of automatic or semi-automatic operation possible or desired, etc. All valves have ⅜″ NPT ports. Unless otherwise noted, all valves are for operating pressures up to 10,000 p.s.i.

COMMON COVER PLATE—MOUNTING PAD

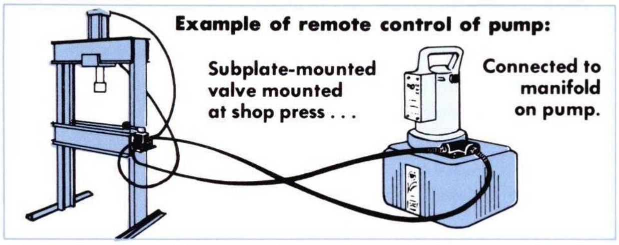


Valves mount on "mounting pad" on common cover plate quickly and easily (with four socket-head cap screws). "A" shows pad exposed: "B" shows valve mounted.

MANIFOLD

— Appropriate when control valve is to be mounted somewhere other than on the pump itself, or, specifically, when valve No. 21712 has been selected.

Manifold—Provides ⅜″ NPT pressure and return ports .... No. 30383


Example of remote control of pump:
Subplate-mounted valve mounted at shop press . . .
Connected to manifold on pump.

2-WAY VALVES

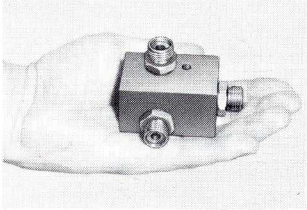
— For operating single-acting cylinders.

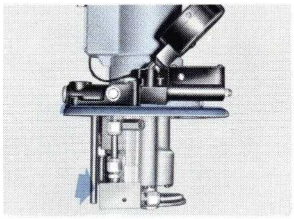
2-Way Manual Valve—Lever-operated, detent positioning, poppet type; usually used with gasoline engine models ... . No. 30384

2-Way Manual Valve — Lever-operated, detent positioning, poppet type; with "advance," "hold" and "return" positions. Has motor control switch, which turns pump motor off when valve handle is in "hold" or "return" position ... No. 30601

2-Way Solenoid Valve—Solenoid-controlled, pilot operated, poppet type. For remote, automatic valve control ...., ... No. 30598

2-Way Pressure-Operated Valve—A special valve (mounted beneath the cover plate) which permits oil to flow to the cylinder ONLY when the pump motor is running; returns oil to the reservoir automatically when the motor is turned off. Appropriate for riveting, swaging, crimping, staking, punching, etc. A manifold (No. 30383) should be used with this valve. Example: Hydraulic-powered riveting—7,500 p.s.i. needed to set the rivet; install pressure switch (see "pressure controls" page 6) adjust to 7,500 p.s.i.; start pump motor; when desired pressure is reached, pressure switch turns off motor; when motor stops, oil returns from cylinder to reservoir automatically; start motor again and repeat the cycle. Will not hold pressure .... No. 21712





4-WAY VALVES

— For operating double-acting cylinders.

4-Way Manual Valve—Lever-operated, shear-seal, open-center type; detent positioning .... No. 30394

4-Way Double Solenoid Valve—Solenoid-controlled, spool-type; 5,000 p.s.i. maximum; for remote, automatic valve control; includes subplate...................... No. 21395

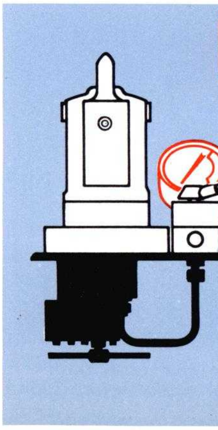
SUBPLATES

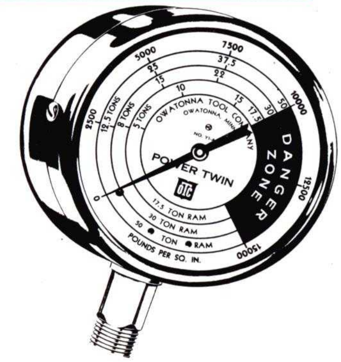
— For remote mounting of 2-way and 4-way manual valves Nos. 30384, 30601, 30394. Has ⅜″ NPT pressure and return ports.

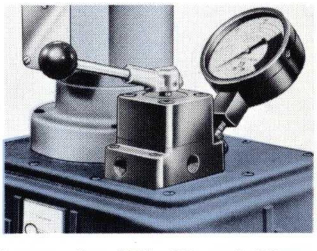
Subplate, only—Basic .... No. 30547

Subplate, only—With built-in pressure regulating valve; can be adjusted to by-pass oil at any given pressure up to 10,000 p.s.i. .... No. 30588

PRESSURE GAUGES







OTC pressure gauges: 3½″ dial diameter face; color-coded, easy to read. Non-breakable crystal. With ¼″ male NPT end.

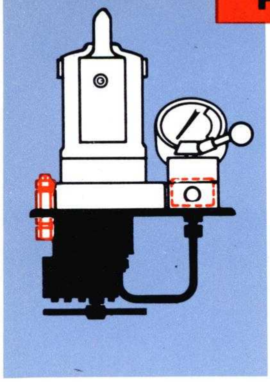
Gauge: Calibrated in lbs. and tons—For 17½, 30 and 50-ton cylinders, and zero to 10,000 p.s.i. .... No. Y1-A

Gauge: Calibrated in lbs. and tons—For 100-ton cylinders, and zero to 10,000 p.s.i. .... No. Y2-A

Gauge: Calibrated in lbs. only. Zero to 10,000 p.s.i. .. No. Y5-A

Gauge: Calibrated in lbs. only. Zero to 6,000 p.s.i. ... No. Y6-A

PRESSURE CONTROLS



Pressure Regulating Valve No. 21163

Pressure Switch No. 40086*

*(This number includes a pressure regulating valve, No. 21163.)

Pressure control accessories are available when a Vanguard application requires the holding or maintaining of pressure.

PRESSURE SWITCH: — attaches to control valve manifold; automatically (electrically) turns off pump motor when a pre-determined pressure has been reached. Can be set at any pressure between 1000 and 10,000 p.s.i. with a 300 p.s.i. differential. (Differential not adjustable.) If pressure drops more than 300 p.s.i. below the pressure setting, action of the pressure switch turns on the pump motor, for just an instant, to bring pressure back up to the pre-determined setting. Pressure, therefore, can be held indefinitely, with the pump motor coming on for only a second now and then to make up for any pressure drops. A simple screw adjustment sets your desired pressure. A pressure regulating valve (see below) is included with each pressure switch.

Especially appropriate for molding, curing, forming, testing operations, etc., where pressure must be held for specified periods of time. (Various degrees of automation can be established with the addition of pressure-operated valve or solenoid-operated control valves and electrical timers.)

Pressure Switch with pressure regulating valve . . **No. 40086**

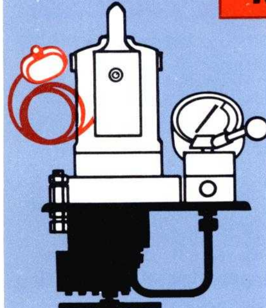
PRESSURE REGULATING VALVE:

A special accessory which bypasses oil at a pre-determined setting, while the motor or engine continues to run. Adjusts from 1000 to 10,000 p.s.i.; a simple screw setting. The PR valve is recommended for brief holding applications only, because of the heat which is generated when oil is bypassed over the PR valve. Using a PR valve is the only method of maintaining pressure with gasoline-engine Vanguards.

When in use with a pressure switch, the PR valve unloads any excess oil that is pumped after the motor is turned off, thereby maintaining the low differential of 300 p.s.i.

Pressure Regulating Valve, only. . . . . **No. 21163**

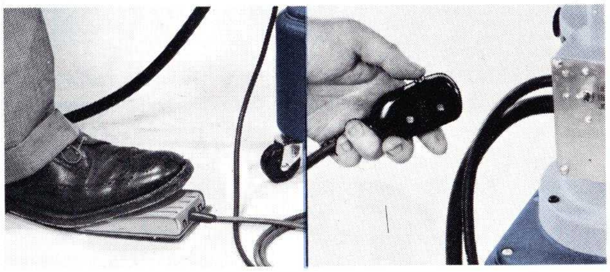
MOTOR CONTROLS



21284

"Standard" motor controls are described under "Motors" (page 4). Each provides a "on-off-jog" toggle switch; the "jog" is especially helpful to the pump operator when his application requires careful, positive control of the pump.

21283

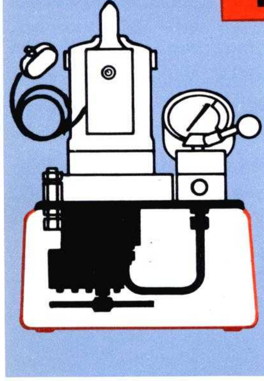


For remote control of the pump motor, a pendant hand switch and a foot switch are available. Give "jog" control. Each has six-foot long cord.

Remote Control Hand Switch. . . . . **No. 21283**

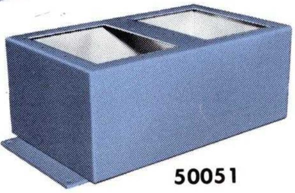
Remote Control Foot Switch . . . . **No. 21284**

RESERVOIRS



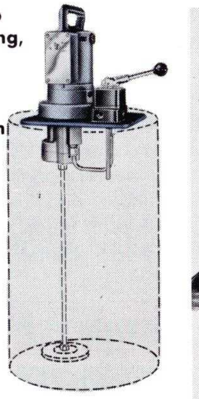
40137

40063



50051

Example of deep reservoir mounting, with intake and return extensions. (2-1/2-ft. suction head max.)



Three standard reservoirs are available: 2, 5 and 7-gallon capacities. The 2-gal. reservoir only (which has four tapped holes) can be optionally equipped with a set of four casters. Each of the three reservoirs accepts the Vanguard common cover plate (shown, right); plate is included with pump, whether or not a reservoir is ordered. Common cover plate permits the Vanguard to be mounted on any size reservoir; suction head of 2-1/2 feet permits the Vanguard to be used in a relatively deep reservoir, such as an oil drum. (See illustration above.)

Oil temperature: To eliminate possible damage to the Vanguard resulting from excessive heating of the oil, it is recommended that oil temperature not exceed 150° F. A larger reservoir and/or forced cooling may be necessary to keep the oil temperature below 150° F. (See "oil," page 7.)

2-Gal. Reservoir—12-1/2" x 10-1/2" and 6-1/2" high; (standard for electric motor models). . . . . **No. 30545**

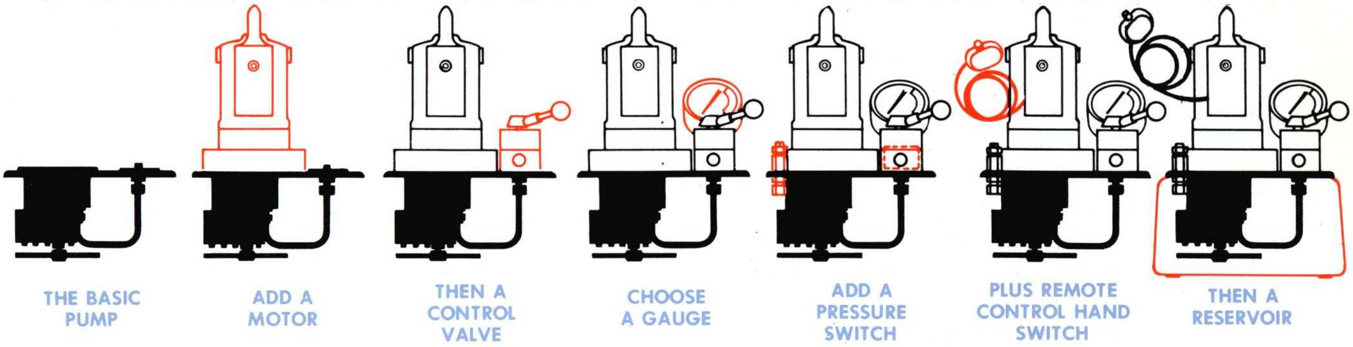
5-Gal. Reservoir—15" x 12" and 8" high; (standard for gasoline engine models). . . . . **No. 40137**

7-Gal. Reservoir—20" x 12" and 8" high; (standard for "tandem" motor models). . . . . **No. 50051**

Casters—Set of four; for use with 2-Gal. reservoir No. 30545 . . . . **No. 10494**

Summary Of Choosing Vanguard Accessories

The "building-block" flexibility of selecting a particular Vanguard power package means you "build" a package to exactly fit your needs, yet pay no custom-built prices. Drawings below review how one Vanguard power package might be selected.



OTHER MISCELLANEOUS HYDRAULIC ACCESSORIES

HOSE— Reinforced, wire-braid hose with spring guards at each end, built specifically to withstand high pressures and still maintain adequate flexibility. Available in two types: (1) 2-ply: for occasional use, such as maintenance work; a light-duty hose. (2) 3-ply: for longer life than the 2-ply; hose for medium to heavy duty. All hose with 3/8" male NPT fittings. Special lengths, asbestos-covered types and hoses with spring guard full-length are available on a special order basis.

	2-PLY HOSE	3-PLY HOSE
30-Inch Length	**No. Y21-4**	—
39-Inch Length	**No. Y21-3**	**No. Y21-9**
6-Foot Length	**No. Y21-2**	**No. Y21-7**
8-Foot Length	**No. Y21-2A**	**No. Y21-8**

COUPLERS— 3/8" NPT. Precision-built and tested at 24,000 p.s.i. Permits disconnecting hose from ram or pump without the loss of oil; can be connected or disconnected at low pressures.

Quick Coupler, complete	**No. Y-25**
Y-25 consists of: Ram half coupler and dust cap	**No. Y25-1**
Hose half coupler	**No. Y25-3**
Dust cap, only, for ram half coupler	**No. Y25-2**
Dust cap, only, for hose half coupler	**No. Y25-4**

OIL— To assure dependable service and long-life of an OTC Vanguard, it is essential that the proper high-quality hydraulic oil be used. There are no long-run savings in using cheap low-grade oil! Two one-gallon containers of high-grade hydraulic oil are shipped automatically with each Vanguard unit. If additional oil is required, use only high-grade hydraulic oil OTC No. YO-24 or equal (300-SSU at 100° F.) Examples of other high-grade oil for use with an OTC Vanguard are:

Standard— **Standoil 31:** for normal temperatures down to 40° F.
Standoil 15: for low temperatures down to -10° F.

Texaco— **PC-R&O:** for normal temperatures down to 40° F.
A-R&O: for low temperatures down to -10° F.
Texamatic Fluid: for extremely low temperatures down to -35° F.

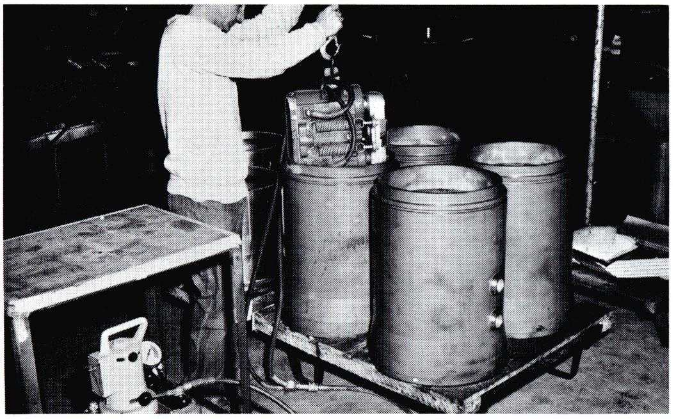
OTC Vanguard Hydraulic Oil, 1-Gal. .... No. YO-24

Examples of Vanguard Applications

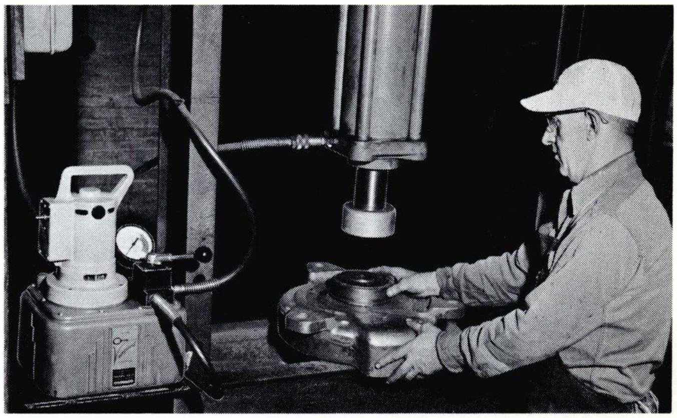
TESTING STRAIGHTENING PRE-STRESSING MOLDING CLAMPING FORMING HOLDING PRESSING SWEDGING CURING

Because of the many advantages of high-pressure hydraulics, such as the savings of space and weight—getting plenty of power, yet keeping the sizes of components small—the use of high-pressure hydraulics is constantly increasing. In some cases, it replaces a mechanical device; other times it replaces a pneumatic installation; also, low-pressure systems often give way to more compact high-pressure systems.

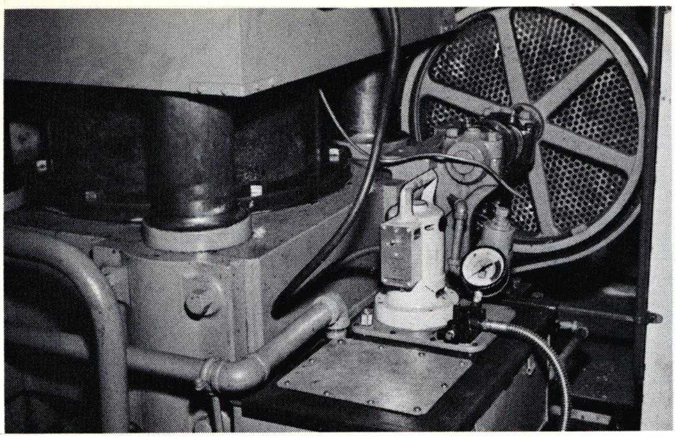
With this trend toward higher pressures, and toward hydraulics in general, the uses of Vanguard as a power source continue to mount—and with each new use, a new and better method!



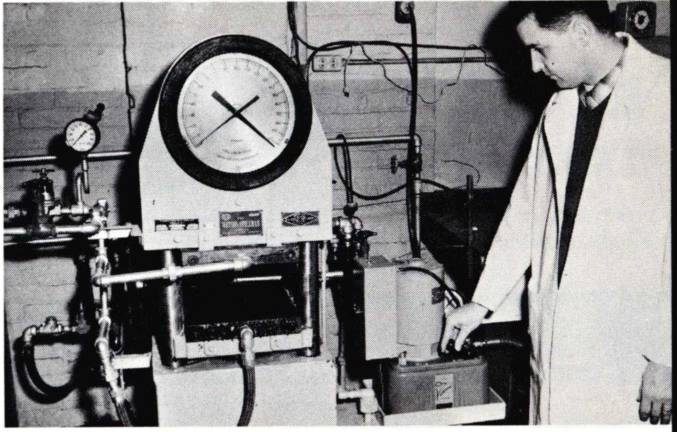
Production time reduced 50% in straightening operation on cylindrical "navy weapon" forgings. Vanguard powers 100-ton twin ram in bringing forgings to a perfect round.



Production increased 200% on press "sizing-straightening" operation with OTC Vanguard. Mandrel-type broach on end of 100-ton double-acting cylinder sizes motor casting holes.

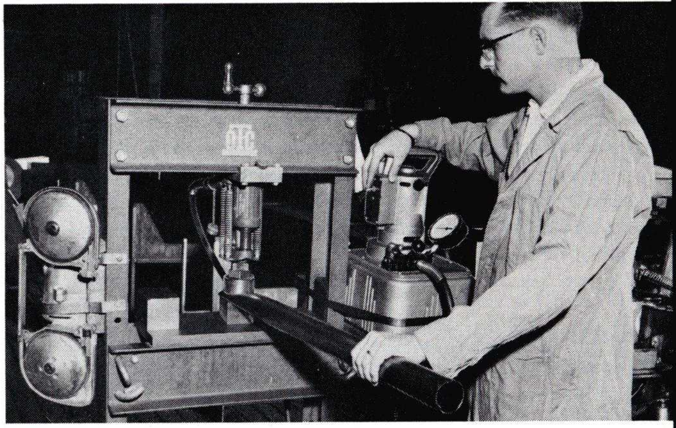


Vanguard powers 100-ton hobbing press; gives positive control and steady pressure. Pump mounted in customer's reservoir.



Vanguard improves product quality, automates curing operation in laminated-plastic testing. Pressure switch maintains p.s.i.

Eight 7/16" strands stressed in 230-ft. bed in only 18 minutes with OTC Vanguard. New fast action in concrete pre-stressing.



Vanguard improves, speeds testing of welded steel tubing. Powers 17-1/2-ton ram. Fast-acting Vanguard replaced slow hand pump.

OTHER HIGH QUALITY OTC HYDRAULIC PRODUCTS

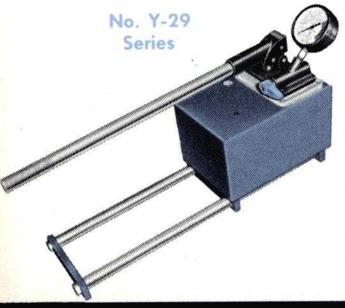
High Pressure Hydraulic Hand Pumps

No. Y21-1

Single-speed hand pump. Develops full 10,000 p.s.i. Delivers .122 cu. in. per stroke. Length: 21". Weight: 15 lbs. Reservoir capacity: 1 Qt. Fingertip control. 3/8" NPT port.

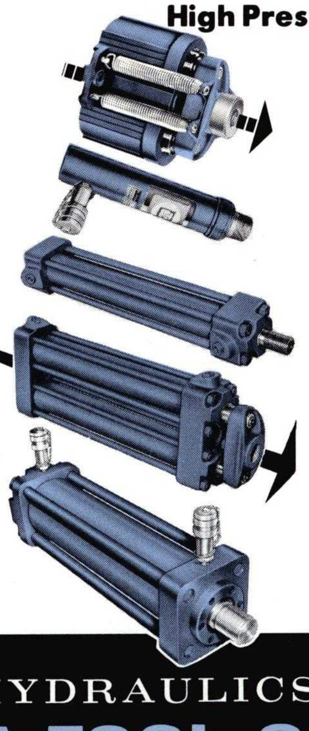
Dualmaster

No. Y-29 Series



Fast-acting two-speed hand pump!—besides delivering .29 cu. in. per stroke in high pressures up to 10,000 p.s.i., delivers 7.35 cu. in. per stroke (0 to 200 p.s.i.) for fast ram approach and return! Choice of 2-way or 4-way valves for operating single or double-acting cylinders. Wt. 34 lbs.; Cap. 2 Gal.

High Pressure Hydraulic Cylinders



"Y"-series—Single-acting, twin-cylinder. "Center-Hole." In 17-1/2, 30, 50 and 100-ton capacities at 10,000 p.s.i.

"YS"-series—Single-acting, single cylinder. Bores from 1-1/8" to 3-3/4". 2 to 50-tons up to 9,000 p.s.i.

"YDS"-series — Double-acting; bores 1-1/2", 2" and 2-1/2"; 8, 15 and 25-tons "push" stroke at 10,000 p.s.i. Choice of stroke length, and tie-rod extensions.

"YDT"-series — Double-acting, twin cylinder. "Center-hole." (Tandem mounting of YDS models.) In 17, 30 and 50-tons "push" at 10,000 p.s.i. Choice of stroke length.

"YD"-series — Double-acting, Heavy-Duty. Bores 3-3/4", 4-1/2", 5-1/8", 6-3/8"; 50, 75, 100, 150-tons at 10,000 p.s.i. Choice of stroke length, and tie-rod extensions.

PRECISION HYDRAULICS DIVISION
OWATONNA TOOL COMPANY
OWATONNA, MINNESOTA; U.S.A.
CABLE: TOOLCO

6-61
LITHO IN U.S.A.